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ABSTRACT

Designed to examine the relevance of television news programming, a study examined the application of a "group use" videodisc in a communication curriculum. Using a computer controlled videodisc, 60 communication students at a large midwestern university were shown the agenda-setting function of television and asked to evaluate the experience. Seventy-four high school faculty members from a school district that had served as a national demonstration center for computer-assisted learning were mailed a questionnaire. Accompanying it was a letter describing the individualized and group approach to instructional design. The teachers were asked to consider five dimensions concerning the application of the design philosophies in their own teaching. These dimensions were: (1) integration into classroom style, (2) use of available classroom time, (3) benefit to students, (4) use of school's financial resources, and (5) preparation for students' lifelong learning. In general, students found the technology easy to use and the group process valuable in examining the components of a news story. In addition, they preferred to work with other people rather than alone with the machine. Faculty respondents perceived the group approach as more consistent, a better use of class time, and a more efficient use of financial resources when contrasted with individualized instruction. However, they also felt that the individualized approach to computer-assisted instruction would better prepare students for lifelong learning. The consensus position recognized that small group and individualized approaches must be combined to optimize the educational process. (Tables of data and a reference list are included.) (JD)

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Designing the Group Use Videodisc

Socializing Communication Technology

ED275015

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ABSTRACT

This paper describes the application of a "group use" videodisc in a communication curriculum designed to examine the social relevance of television news programming. In general, students found the technology easy to use, working with other people preferable to working alone with a machine and the group process valuable in examining what contributes to the importance of a news story. Faculty perceived the group approach as more consistent a better use of class time and a more efficient use of financial resources when contrasted with individualized instruction. However, they also felt that the individualized approach to computer-assisted instruction was more beneficial to the student and would better prepare the student for lifelong learning. This apparent paradox, the videodisc as an enhancement to computer-assisted instruction, and technology's influence on the student-faculty relationship are discussed.

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ABSTRACT

This paper describes the application of a "group use" videodisc in a communication curriculum designed to examine the social relevance of television news programming. In general, students found the technology easy to use, working with other people preferable to working alone with a machine and the group process valuable in examining what contributes to the importance of a news story. Faculty perceived the group approach as a better use of class time and a more efficient use of financial resources when contrasted with individualized instruction. However, they also felt that the individualized approach to computer-assisted instruction was more beneficial to the student and would better prepare the student for lifelong learning. This apparent paradox, the videodisc as an enhancement to computer-assisted instruction, and technology's influence on the student-faculty relationship are discussed.

INTRODUCTION

Over the last four years the number of computers in the classroom has risen from approximately 30,000 to more than 1.1 million units (Watkins, 1985). Applications of computer-assisted instruction have been found for nearly every cognate area in education.

Although many computers have been placed in the classroom, their place in the educational process remains a topic of debate. The concerns of educators range from the large budgetary commitment schools must make, typically at the expense of other human or technological resources, to the effects machine-based learning has on the faculty-student relationship. Perhaps an even more central issue is which instructional design strategies make most effective use of the new technologies.

The purpose of this paper is to describe the creation of a computer-controlled videodisc and the instructional design strategy that

guides its use in a communication curriculum. A formative evaluation of this technology/design strategy by students and faculty is presented. The relationships among design strategy, teacher-student interaction and budgetary issues are then considered.

The literature review presents a rationale for using computers to foster the small group communication process as contrasted to the instructional design approach that emphasizes individualized instruction. In the Methods section of the paper, a computer-controlled videodisc designed for group examination of the agenda-setting function of the mass media is described.

Literature Review

Cronbach and Snow (1977) succinctly state the argument that favors an individualized approach to education:

> "In education, dozens of drastic reforms, from alternative schools to computer-regulated systems now bid for attention. In nearly all of them, adaptation to individual differences is the theme. Human resources are badly used when society puts everyone into one-track schooling and periodically culls out the unsuccessful" (p. 49).

Suppes (1979) champions the benefits of individualized instruction for mathematics education. Many others (e.g. Hoffman & Waters, 1982) present compelling cases in which special populations have made major cognitive strides when removed from the pressures of keeping up with a class or fearing public failure.

The interest in the benefits of individualized instruction has arisen partly in response to overcrowding in the public schools and universities. Under conditions of overenrollment, educational institutions have progressively retreated into the lecture-discussion mode of conducting education. While this fulfills the pragmatic need of

exposing students to information, the educational value of this format is weakened because it removes students from an active role in learning. Large lectures inherently limit the ability of individual students to interact about the material during its presentation.

The loss of learner engagement directly and proportionally reduces the quality of education (Jernstedt, 1982). More active, responsive engagement of the learner can be accomplished by improving the student-teacher ratio or by introducing machines as the interactant for the student. Machines (computers) are nonjudgmental, tireless and more available than skilled teachers. They suffer from restricted response patterns (branching routines), difficulty in modeling individual learning styles and in inadequate presentation of visual information (Acker, 1985). The cost and difficulty of finding competent teachers has limited the increase in staff as a solution to encourage student involvement.

Jernstedt (1983) presents this alternative for increasing engagement:

> [T]he greatest potential for interaction in the classroom lies with relationships between students. Even if preferred, there is simply not enough time for extensive dyadic interactions between student and teacher, and a methodology based on such interaction would be impractical. The focus of interpersonal relations, for academic goals, should therefore be on peer relationships."

A focus on peer relationships is consistent with principles that guide education in the area of communication. Mead (1934) emphasizes the importance of the group in an individual's development:

> "What goes to make up the organized self is the attitudes which are common to the group. A person is a

> personality because he belongs to a community, because he takes over the institutions of that community into his own conduct. He takes its language as a medium by which he gets his personality, and then through a process of taking the different roles that all the others furnish he comes to get the attitudes of the members of the community (p. 162)."

This social organization is dependent upon individuals being able to place themselves in the perspective of others, to take their points of view (Strauss, 1964, p. 346). Discovery learning can be facilitated through collaboration, on which students themselves take over some of the work of a coach by sharing their knowledge, tutoring each other, articulating their own reasoning about a problem, or playing a particular role in a shared learning process (Brown, 1985, p. 109-110). "A self can arise only where there is a social process within which this self has had its inititiation" (Strauss, 1956, p. 41). Developing a self-concept and healthy social relationships is a major part of education as a social structure, which functions as an anchorage for shared attitudes and values (Sereno, et al., 1970, p. 359).

These learning experiences are best characterized by small-group projects on which students are required to go beyond the independent practice of skills (for the sake of skill acquisition alone) to create real-life products that could be used or shared with others (Kierstead, 1985, p. 25). Experience with various small-group projects facilitated by teacher interaction promotes adaptability within and among students. Adaptability is the "x of the xyz of survival" for Boulding, particularly in an area of rapid change such as the revolution of the information age (1974). An adaptive learning environment provides an interactive setting where abilities and talents emerge as important for adjustment between abilities and modes

of learning (Glaser, 1974). The teacher provides a flexible environment for discovery instead of a fixed environment to which the student is expected to adjust.

Using technology as a teaching machine alone eliminates the social exchange which is a necessary part of the educational process. Piaget (1971) suggests this integration of teaching machines into the educational process:

> "[I]t is possible that the use of teaching machines will save time that would have been needlessly wasted by more traditional methods and therefore augment the number of hours available for active work. So that, particularly if the periods of active work include teamwork, with all that such work entails in the way of mutual incentives and checks, while the machine presupposes an essentially individualized kind of work, then this balance would at the same time be realizing yet another necessary land of balance: that between the collective and individual aspects of intellectual effort, both so essential to a harmonious school life" (p. 79).

Jernstedt (1983) characterizes the issue this way:

> "With individualized instruction, and especially computers, the technologists have created an efficient, effective, but impersonal process. In contrast, the humanists have contributed through interpersonal interactions, a personal, supportive, but relatively inefficient process. Successful combinations of interpersonal relations and computer aided learning has not been accomplished. Those educators focused on technology, whether the translation of existing materials to computer routines or the understanding of individualized instruction methods, have missed the interpersonal.... Conversely, human relations oriented educators have treated machines as near anathema" (p. 98).

The educational system described below was designed to use technology to bring an educational experience to students organized in groups of four or five persons. The subject matter delivered using a computer-controlled videodisc concerns the agenda setting function of

television; i.e. the correlation between the public's perception of the social relevance of issues presented on network news and the presentation of those issues through such production features as story length and visual conventions. Learning outcomes in terms of subject mastery were not measured; rather in this formative evaluation the student's evaluation of the learning process was of interest. Separately, faculty were surveyed to determine their opinions of the relative merits of group and individualized use of computer-based technologies.

METHOD

Subjects

Sixty students at a large midwestern university participated in this study. Each subject was a member of a communication class and participated as a member of a small group consisting of four or five individuals. Also, 74 High School faculty members from a school district that has served as a national demonstration center for computer-assisted education for three years participated in a subsequent stage of this project. While in many respects a University-level faculty is the logical choice to complement a university student population, the high school faculty was chosen because of its relative homogeneity with respect to experience with computers.

Materials

A videodisc is a digitally encoded twelve-inch "record" on which each of 54,000 grooves (frames) of information has a unique address. A videodisc player is capable of locating any of these individual frames in less than three seconds and then presenting either a motion

sequence or freezing on the accessed frame. When the videodisc is controlled by a computer it is known as a level 3 videodisc (Floyd & Floyd, 1982). Level 3 videodiscs are typically highly interactive and under the control of individuals viewing the videodisc. See Howe (1985), Allen (1985), Cash (1985), and Floyd & Floyd, (1982) for a more complete discussion of videodisc technology/applications.

A level-3 videodisc formulated on the group use design strategy was mastered for this project to reflect this observation by Bunderson et al. (1984):

> "In the long run the videodisc or some descendent technology may help restore a balance to our currently visually impoverished classrooms. Because of limitations of computer intelligence, however, we anticipate that for some time to come much of the intelligent conversation that promotes learning will be provided by skilled and interested humans" (p. 214).

The videodisc mastered for this project is titled The Newsdisc and used the satellite feed of CBS's evening broadcast of September 7, 1983 as a source of programming. The newscasts' 17 stories, which ranged in length from twelve seconds to 4 minutes and 13 seconds and exhibited the usual array of news production techniques, were randomly ordered on The Newsdisc; all commercials and continuities between stories were deleted. In addition, a character generator was used to create individual frames that provided instructions on how to use the videodisc.

An Apple IIe computer programmed in SuperPilot, a Pascal-based authoring language, guides the use of the disc and tracks all user responses to the video material. The disc was used by "news teams" charged with the task of making editorial decisions to determine the

order in which the evening news' stories should be presented to the nation's viewers. Students are told to order the stories on the basis of their importance rather than to orchestrate the news flow to keep viewers tuned in for the entire newscast.

The news team learns from the opening frames of the disc that the reporter's stories, complete with video, are filed on the random access disc. They view and discuss each video clip and ultimately sequence the 17 stories to make up the newscast. SuperPilot remembers the deliberations and the final sequence of stories and presents the news team's rendition of the CBS Evening News with Dan Rather. The newscast they create reflects their group perception of the relative importance of each story.

This videodisc design strategy is intended to emphasize the social dimension of knowledge; that many "facts" are shared beliefs and not inherent truths. Each member of the news editorial team tries to impose their notion of important news on the group-decision process. The interaction occurs among the members of the group as they seek consensus; the pedagogic interaction is not between the students and the videodisc. The videodisc's purpose is to present information for group deliberation; the computer program's purpose is to display the collective social perception of the facts. This instructional strategy focuses on the equivocal nature of social "truth" and tries to develop the reasoning/argumentation skills of those working with the disc.

A five question survey was developed to probe the students' evaluation of their experience with the videodisc. The questions examined

the ease of working with the technology, their opinions of the group experience and the value of the exercise for understanding news programming.

A second survey was prepared and distributed to the High School faculty. The cover letter provided a succinct description of the individualized and group approach to instructional design and asked each faculty member to consider five dimensions concerning the application of the design philosophies in their own teaching. The dimensions were:

(1) integration into classroom style

(2) use of available class time

(3) benefit to students

(4) use of school's financial resources, and

(5) preparation for student's lifelong learning.

Procedures

Groups consisting of four to six students were taken to a viewing room that contained an Apple IIe computer, the videodisc player and a 25-inch monitor on which the news stories and computerized instructions were displayed. The computer program has three subroutines: (1) news viewing, (2) news creating, and (3) news playback. In the news viewing mode, students selected the story they wished to view. They were encouraged to take notes or review stories as often as needed. After viewing the seventeen stories, each student individually ranked the stories from most important to least important. They were asked to work from this definition of social importance: "The most important story would present news MOST LIKELY to impact in a MAJOR WAY the lives of a LARGE NUMBER of U.S. citizens. The least

important story would likely have a MINOR INFLUENCE on the lives of a FEW U.S. citizens. This definition is purposefully broad to encourage individual deliberation."

In the news creating section of the program, students share their individual order and must agree on a group ordering of the material. They were given 30 minutes "to get the news on the air." During this 30 minutes, each individual shared their reasons for their ranking of the stories in terms of their importance to society. This permitted an exploration of the relation between the news stories and the societal values they reflect. The computer program permits the group to change its collective mind if it is so inclined at any stage of the deliberation.

Once the group reaches consensus, the program proceeeds to the playback mode. Under the control of the computer, the videodisc sequences the presentation in the order requested by the news team. During this phase, the instructor has the opportunity to question the students about their ranking of the relative importance of the stories. The visualization of the story, length, position and story topic serve as the basis for discussion.

After participating in the three phases of the videodisc program, subjects filled out a five item questionnaire. A four-point scale of Strongly Agree, Agree, Disagree, and Strongly Disagree was provided for responses. The computer program stored the deliberations of the news team so that the group decisions of the 13 groups who participated could be compared at a later time.

In addition to gathering data on the experiences of students, the expectations of educators were surveyed. The questionnaire was

distributed to 150 faculty mailboxes. The cover letter described the principal benefits of individualized instructional design in this manner: "[This approach] allows students to work at their own pace and without peer pressure." The benefits of the group instructional design were described as: "encouraging the realization that much of knowledge or "truth" is socially-based." Faculty members were asked to indicate whether the individualized or group design orientation was preferable along the five previously described educational dimensions. Respondents had the option of "no difference" for each item. Departmental affiliation and comments were also collected from each of the 74 respondents, representing a 49 percent return rate.

Analysis

For each question, the percentage of student responses in each category Strongly Agree, Agree, Disagree, and Strongly Disagree was calculated as were the mean and standard deviations of the distribution of responses. The Strongly Agree and Agree categories were then aggregated into a category labeled Positive and Disagree and Strongly Disagree were aggregated into a Negative category. A biromial test of whether the response pattern differed from a fifty-fifty split was then conducted.

Faculty preferred either the group or individual approach along five instructional dimensions. For each question, the option No Difference was available. These data were subjected to the sign test, appropriate for ordinal-level data in which the magnitude of the difference between categories cannot be determined.

RESULTS

In general, students were favorably impressed with their videodisc experience even though the process of reaching consensus seemed to require the re-ordering of individual rankings. Ninety percent of the students found the videodisc system easy to use and 75 percent felt the group process was helpful for understanding news programming. While 85 percent thought the group discussions helped identify the important stories, one-half of the students felt their personal rankings had to change to accommodate the groups' consensus. Importantly, a full 87 percent of those using this computer-based technology preferred working with the machine in the presence of other people than working with the machine alone. Table 1 presents the results of the students survey.

TABLE 1 ABOUT HERE

There was greater divergence in the responses to the issues raised in the faculty survey. Of those who expressed a preference for either the group or individualized instructional design strategy, more felt the group approach made better use of class time (69% group/31% individual) and would make best use of the school's financial resources (88% group/12% individual). However, the individualized approach was preferred for student outcomes. Among those expressing a preference, 69% felt the individualized approach would be most beneficial for the student and 74% felt the individualized approach would better prepare students for lifelong learning. Although 58% of the respondents in this sample felt the group approach would integrate

more easily into their classroom style than an individualized approach, the results are not statistically significant. The complete results, which included a No Difference category, are presented in Table 2.

TABLE 2 ABOUT HERE

DISCUSSION

The results of the faculty survey encapsule a dilemma for education: overall, the faculty felt that using technology to bring information to small groups of students makes better use of class time and is more cost effective. At the same time they considered the group approach less beneficial to the student and less useful for preparing the student for lifelong learning when compared to individualized instruction. The resources brought to education are the time of the faculty and the investment the school system makes in learning technology, whether computers or text books. The educational "product" is supposed to be well-prepared students. Based on the survey results, this equation is out of balance: efficient use of resources based on group processes is not considered optimum for benefitting the student.

To better understand the incongruous faculty responses, teachers were interviewed after the surveys had been returned and tabulated. The resolution of the apparent inconsistencies is intriguing. There is a national cry for a return to individualized instruction reflected in directives from school administration and demands of students. However, in the interviews it became apparent that the idea of individualized instruction may refer to interaction between the teacher and individual students rather than the student's individual involvement with the subject matter.

The promise of computer-assisted education has always been more time on task approached by a student at his or her most appropriate pace. The demands of students and classroom instructors might be more accurately interpreted as more time for individual students to interact about rather than with the subject matter.

In this light, the group use of computer-based educational material might individualize the student interactions more than instructional strategies devised around student-machine interactions. Perhaps the social context is the more appropriate if that context encourages exchange among participants rather than the one-way flow of information from an authority (teacher or machine) to students whether in a large class or alone with the computer.

This interpretation is consistent with the response of students who actually experienced the group-use videodisc. They became absorbed in the process of justifying their reaction to the material presented rather than absorbed in the material itself. Indeed, learning about agenda setting implies that how others perceive the importance of news is central and disavows the notion that the importance of news exists outside of a social context.

A second issue raised by the data concerns compatability (i.e. the similarity of the characteristics of an innovation with the current practices or values of the social system) which, according to Rogers (1983), is positively correlated with the adoption of an innovation. Group use of computer-based technologies accents the teacher's traditional role as a leader of critical group discussions and should be more compatible than individualized instruction which in

part changes the teacher's role to that of a monitor of the student-machine interaction and evaluator of the learning created through the machine-based process. Diffusion theory would predict resistance to the adoption of computer-assisted education if applied in a manner incompatible with the teacher's perceived role and values. For example, overlooking the classroom teacher's personal approach to teaching has been cited as a key factor in the underutilization of television as an educational resource (Anderson & Ploghoft, 1980).

Differences between computer-controlled videodisc instruction and instruction supported only by a computer should also be mentioned. Software available for stand-alone computers is constrained by the difficulty of generating and storing sophisticated graphics and the complexity of modeling individual learning strategies using traditional branching subroutines. In the case of a level-3 videodisc, the computer's role is one of managing the presentation of instructional material; the more information-rich videodisc carries the actual content.

If the introduction of technology into the classroom is to continue at the current accelerated pace, the use of technology must be efficient. If not, the problems of educational television--an adequate supply of film projectors and videotape players with visual programming ten years out of date--will be replicated. Educational technologies are expensive; if the capitalization of the teacher as a human resource is to pay-off, further exploration of the group process as a context for learning is needed.

Introducing the videodisc as a component of instructional technology further increases the cost of learning machines. In spite of

the added cost, the maximum benefits of the computer, efficient at managing but not presenting instruction, may require yoking it to more information-rich technologies such as the videodisc and putting the technology under the control of the teacher rather than the student. More likely, and as often recommended by faculty respondents, a combination of group and individualized strategies will produce the highest level of subject mastery and the most efficient use of instructional technology.

CONCLUSIONS

This paper has described the application of a group use videodisc in a communication curriculum designed to examine the social relevance of television news programming. In general, students found the technology easy to use, working with other people preferable to working alone with a machine and the group process valuable in examining what contributes to the importance of a news story. These outcomes occurred even though the opinions held by individuals often differed from the final group consensus required by the exercise.

In addition to data gathered from the experience of students, faculty expectations were collected concerning the relative advantages of group vs. individualized instructional design strategies for using technology. These faculty, employed by a High School which has served for three years as a national center for the evaluation of computers in education, perceived the group approach as a better use of class time and a more efficient use of financial resources. However, they also felt that the individualized approach was more beneficial to the student and would better prepare the student for lifelong learning.

Follow-up interviews with faculty members suggested that this paradox might hinge on the interpretation of the term individualized with faculty and administrators thinking of an individualized curriculum as a mechanism to encourage teacher-student interaction more than individualizing student-material interaction as facilitated by the computer. The consensus position recognizes that small group and individualized approaches must be combined to optimize the educational process.

Future research must go beyond this formative stage and more carefully define educational objectives such that the learning outcomes of group-based human-machine interactions can be compared to learning outcomes from individualized human-machine interactions. Similarly, the differential impact of group or individual design on the educational budget and adoption/utilization of educational technology must receive the attention of researchers.[1]

[1] A follow-up study is underway to more formally evaluate learning outcomes based on the group-use model. As Bunderson, et al (1984) point out, a weakness of most evaluation research on new educational technologies is that the evaluation is carried out by the software designers. To encourage external review, The Newsdisc and the associated software will be made available to any researcher wishing to pursue this line of inquiry. Hardware compatibility is assured with an Apple IIe (DOS 3.3) and MCA Discovision Model II videodisc player. Other hardware configurations may be useable with minor software modifications.

Table 1

Student Opinions Regarding Group Use Videodisc Reported as Percentages (n=60)

	SA=1	A=2	D=3	SD=4	Mean	Stand. Dev.
Using the computer/videodisc system was easy.*	43	47	7	3	1.7	.74
In general, my story rankings were close to the group rankings.	10	40	42	8	2.4	.78
Group discussions helped identify socially important stories.*	35	50	10	5	1.8	.80
Working with other people and a machine is preferable to working alone with a machine.*	40	47	11	2	1.7	.73
Creating a newscast from videodisc is a helpful group exercise for understanding news programming.*	32	43	20	5	2.0	.85

Note: SA=Strongly Agree, A=Agree, D=Disagree, SD=Strongly Disagree.

*$p<.01$ that the percentage of the sample agreeing or strongly agreeing with the statement equals fifty percent.

Table 2

Faculty Comparison of Relative Advantage of Group Vs. Individualized Instructional Design Strategies (n=74). Responses Presented as Percentages

	I	G	ND	Sign Test Z-score
Which design approach would most easily integrate into your present classroom style?	37	52	11	1.24
Which design approach would make best use of your time with the class?	27	60	13	3.02*
Which design approach would most benefit the student for your subject?	55	25	20	2.91*
Which design strategy would make best use of the school's financial resources?	10	75	15	5.65*
Which design approach will help best prepare students for lifelong learning?	56	20	24	3.40*

Note: I=Individualized, G=Group, ND=No Difference

*p<.01

REFERENCES

Acker, S. R. (1985-86). Redesigning the human-machine interface for computer-mediated visual technologies. Journal of Educational Technology Systems, 14(1), 23-33.

Allen, D. (January, 1985). Linking computers to videodisc players. Videography, 26-34.

Anderson, J. A. & Ploghoft, M. E. (1980). Receivership skills: The television experience. In D. Nimmo (Ed.), Communication Yearbook (pp. 293-307), New Brunswick, N.J.: Transaction Books.

Boulding, K. E. (1974). Alternative futures in education and learning: Symposium '73. Research for Better Schools, Inc. Philadelphia, Pa. (audio cassette).

Brown, J. S. (1985). Idea amplifiers--New kinds of electronic learning environments. Educational Horizons, 63(3), 10-12.

Bunderson, C., Baillio, B., Olsen, J., Lipson, J., & Fisher, K. (1984). Instructional effectiveness of an intelligent videodisc in biology. Machine-mediated Learning, 1(2), 175-215.

Cash, J. (August, 1985). The museum on Laser videodisc. Museum News, 19-35.

Cronbach, L. & Snow, R. (1977). Aptitutes and instructional methods. New York: Irvington Publishers.

Floyd, S. & Floyd, B. (Eds.), (1982). Handbook of interactive video. White Plains, NY: Knowledge Industry Publications.

Glaser, R. (1974). Alternative futures in education and learning: Symposium '73. Philadelphia, Pa. (audio cassette).

Hoffman, J. & Waters, K. (March, 1982). Some effects of student personality on success with computer-assisted instruction. Educational Technology, 20-21.

Howe, S. F. (January, 1985). Interactive video: Salt and pepper technology. Media and Methods, 8-20.

Jernstedt, G. C. (1982). Active learning increases educational effectiveness and efficiency. T.H.E. Journal, 10, 97-100, 105.

Jernstedt, G. C. (May, 1983). Computer enhanced collaborative learning: A new technology for education. T.H.E. Journal, 10, 96-101.

Mead, G. (1934). Mind, self and society. Illinois University of Chicago Press.

Kierstead, J. (1985). Direct instruction and experimental approaches: Are they really mutually exclusive? Educational Leadership, 42(8), 25-30.

Piaget, J. (1971). The science of education and the psychology of the child. New York: The Viking Press.

Rogers, E. R. (1983). Diffusion of Innovations (3rd ed.). New York: The Free Press.

Sereno, K. K. & Mortensen, D. C. (1970). Foundations of communication theory. New York: Harper and Row.

Strauss, A. (1964). George Herbert Mead on social psychology. Illinois: The University of Chicago Press.

Strauss, A. (1956). The social psychology of George Herbert Mead. Illinois: The University of Chicago Press.

Suppes, P. (1979). Current trends in computer-assisted instruction. Advances in Computers, 15, 239-283.

Watkins, L. M. (September 24, 1985). Computers in the classroom lend teachers a helping hand. The Wall Street Journal, p. 1.